

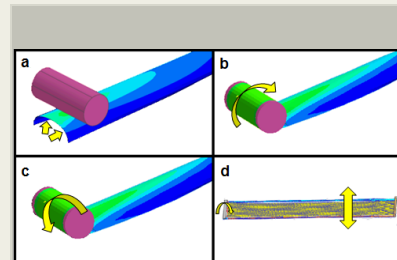
Simulating Nonlinear Dynamics of Deployable Space Structures, Phase I

Completed Technology Project (2014 - 2014)



Project Introduction

To support NASA's vital interest in developing much larger solar array structures over the next 20 years, MotionPort LLC's Phase I SBIR project will strengthen validated modeling analysis and simulation techniques by developing a vertical application to simulate the nonlinear dynamics of the various stages of deployable space structures. This application which will support RecurDyn Multi-Body Dynamics (MBD) software, acquired by NASA in 2013, will increase efficiency and reduce errors, time and the need for advanced knowledge. Currently, modeling complex flexible body non-linear structures can be time consuming and prone to error. Existing nonlinear structural analysis simulation software does not effectively simulate structural assemblies with significant motion. Creation of a custom vertical application for the simulation of deployable space structures would provide a large reduction in the specialized knowledge needed to develop models and would automate tedious tasks. The proposed innovations of this Phase I SBIR project are: 1. A focused vertical software application for the dynamic simulation of the rollup, deployment and maneuvering operation of large solar array structures consisting of a set of functions that are layered on commercial Multi-Body Dynamics (MBD) simulation software that also has the capability of the nonlinear simulation of flexible (Finite-Element [FE] or mesh-based) bodies; and 2. Development of an active, nonlinear controller that will reduce the deflection of a roll-out solar array (ROSA) during spacecraft maneuvers. This development includes the creation and use of a unique simulation environment that couples the controller simulation with the nonlinear structural response of the ROSA. The Phase II project will add capabilities and improve integration of functions, including new support of the simulation of lanyards and tape springs. Additional type of deployable space structures can be simulated, including antennas.



Simulating Nonlinear Dynamics
of Deployable Space Structures
Project Image

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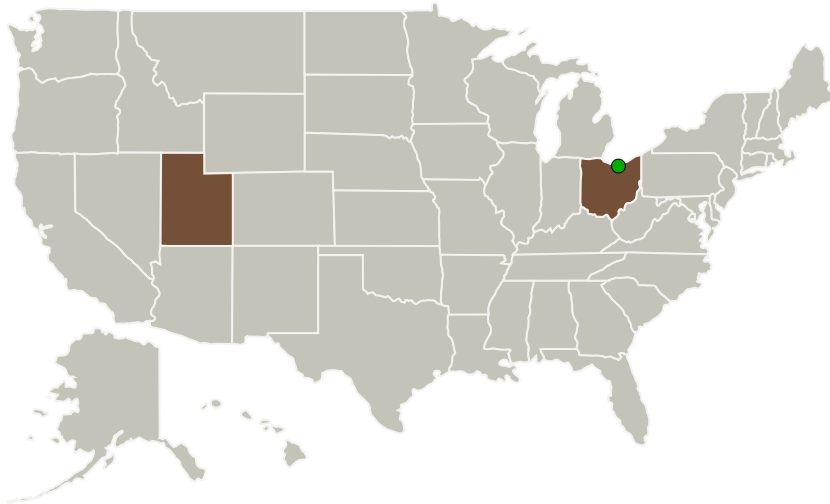
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Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
MotionPort, LLC	Lead Organization	Industry	Saint George, Utah
● Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations

Ohio	Utah
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Project Transitions

June 2014: Project Start

December 2014: Closed out

Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/137649>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

MotionPort, LLC

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

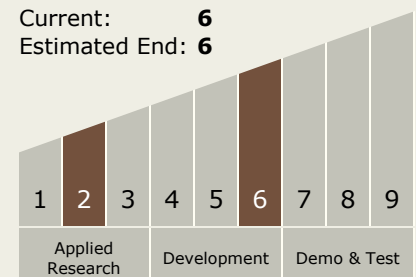
Carlos Torrez

Principal Investigator:

Brant Ross

Technology Maturity (TRL)

Start: 2
Current: 6
Estimated End: 6

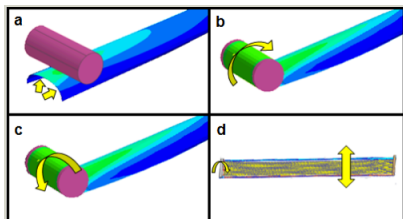


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Images



Project Image

Simulating Nonlinear Dynamics of
Deployable Space Structures

Project Image

(<https://techport.nasa.gov/image/135020>)

Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
 - └ TX12.2 Structures
 - └ TX12.2.1 Lightweight Concepts

Target Destinations

The Sun, Earth, The Moon,
Mars, Others Inside the Solar
System, Outside the Solar
System